

Paper manufacture in medieval India

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The article essays at bringing together the knowledge of paper manufacture in medieval India as derived from various sources, such as texts, paintings and reports of physical remains. An attempt has been made to identify changes in the manufacturing process and also to explain why the paper produced in medieval India remained of an inferior quality when compared to European paper.

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Originating in China, paper manufacture has had a history of diffusion whose progress over the different parts of the Old World has been diligently studied by historians of technology.¹ Some interest has been taken in the arrival of paper in India, and P.K. Gode was a pioneer in studying the traditional process of paper manufacture in India.² Irfan Habib also made some comments and provided some evidence on the production and use of paper in medieval times.³ This article seeks to build further on these studies.

The earliest remains of paper found in India (pre-1947 frontiers) are from the town of Mansura in Sind, all of whose remains are dated earlier to 1030 AD.⁴ Whether the paper was locally manufactured is, however, uncertain. The actual manufacture was certainly established in Delhi by the thirteenth century. Amir Khusrau at the close of that century refers to the manufacture

¹ For the early history of paper, see A.P. Usher, *A History of Mechanical Inventions*, Boston, 1959, pp. 238–39; and Tsien Tsuen-Hsuei, *Paper and Printing*, being Joseph Needham, ed., *Science and Civilization in China*, Vol. V(1), Cambridge, 1985.

² P.K. Gode, *Studies in Indian Cultural History*, Vol. III, Poona, 1969, Part I, pp. 1–12, 18–23. See also D.C. Sircar, *Indian Epigraphy*, Delhi, 1965, p. 67.

³ For example in his articles ‘Technological Changes and Society, 13th and 14th Centuries’, *Proceedings of the Indian History Congress*, 31st session, 1969, pp. 139–61, and ‘Changes in Technology in Medieval India’, *Studies in History*, Vol. II(1) (1980), pp. 22–25.

⁴ Ahmad Nabi Khan, *Al-Mansurah, A Forgotten Arabic Metropolis in Pakistan*, Karachi, 1990, pp. 88–89 (items of burnt Arabic manuscript, Nos 199–205). It is curious that the distinguished excavator did not note the technological importance of the find, nor did he care to date the layer (No. 2) by the carbon-dating method.

of paper as one of the contemporary crafts.⁵ However, the production of paper probably did not meet the actual demand. Thus, we have evidence of the re-use of paper. When certain royal orders were cancelled by Balban, the papers carrying the original orders were washed and re-written upon.⁶

By the middle of the fourteenth century, the production appears to have grown manifold, and that even sweetmeat sellers of Delhi used to sell sweets packed in waste paper to customers.⁷ Its manufacture spread to other parts. In 1432, Ma Huan noticed in Bengal ‘a kind of white paper’, which was made ‘from tree bark’ and was ‘glossy and smooth, like deer skin’.⁸ Presumably, the bark was first reduced to pulp.

The first reference to ‘paper mills’ or ‘paper manufactories’ comes from Babur who saw some of them in the environs of Samarqand:

The best paper in the world is made there [Samarqand]; the water for the paper-mortars (*jawāz kāghaz*) all comes from *Kān-i Gil*, a meadow on the banks of Qarā Sū (Blackwater) or Āb-i raḥmat...⁹

Here, it is interesting to note that the mortar for pulping raw matter was turned by water, a mode later found in use in Kashmir, as we shall see.

By this time, we had also started hearing about the good quality of paper manufactured in India in a work by al-Gharnāṭi of Spain (d.1169–70):

The Samarqandi paper supplanted the *kāghaz-i Miṣrī* (Egyptian paper) just as the latter had excelled that of *Maghrib*. The paper made at Balkh could be favourably compared with that of Iraq, Khurasan and Hind.¹⁰

⁵ Amīr Khusrāu, *Qirānūs Sa’dain*, ed. Muhammad Ismail, Aligarh, 1918, pp. 177, 228–30.

⁶ Ziyā Baranī, *Tarīkh-i Fīrūzshāhī*, Bib. Ind., Calcutta, p. 64. A Persian text written in 1606 prescribes a formula for removing writings from paper in order to use it afresh: ‘Take some ceruse, triturate it with liquid gum Arabic and apply to the writing. When it is dry, use the polisher and the writing will disappear’. See Qadi Ahmad, ‘Calligraphers and Painters’, ed. & tr. V. Minorsky, *Freer Gallery of Art Occasional Papers*, II (3), 1959.

⁷ Ḥamid Qalandar, *Khairul Majālis*, ed. K.A. Nizami, Aligarh, 1959, p. 203.

⁸ Ma Huan, *Yang-yai Sheng-lan, The Overall Survey of the Ocean Shores*, translated from Chinese by J.V.G. Mills, Cambridge, 1970, p. 163. This kind of paper may have been introduced from Tibet, where it was made ‘from thin bark or rather cuticle of slender boughs of a shrub which grows there’ (see Ippolito Desideri, ‘Il Tibet’, trans. Philippo de Philippi, *An Account of Tibet: the Travels of Ippolito Desideri, S.J., 1712–1727*, London, 1932, pp. 141–42).

⁹ Zahiruddin Muḥammad Bābur, *Bābur Nāma*, ‘Abdur Raḥīm Khān-i Khānān’s Persian translation, *Bāburnāma*, MS. BM. Or. 3714, f.63b, and the original Turki text in *The Bābur Nāma* (Haidarabad Codex) ed. A.S. Beveridge, London, 1971, ff.47b–48a. In his translation of the passage Thackston has missed the sense and translated *jawāz kāghaz* as ‘paper factories’ (Wheeler M. Thackston, *Baburnama, Memoirs of Babur, Prince and Emperor*, New York, 1996, p. 86).

¹⁰ Abu Ḥamid al-Gharnāṭi, *Tuhfat ul Albāb*, ed., G. Ferrard, Paris, 1925, p. 202.

The quality of Indian paper can be discerned from the fact that when gifts were exchanged between the ruler of Khurasan and Sultan Zainul 'Abidin of Kashmir (1417–67), paper was an important component in it:

Sultan Abū Sa'īd (of Khurasan) sent fine Arab horses and strong camels of good breed as presents to Sultan Zainul 'Abidin. Pleased with this act of courtesy, the Sultan in return sent saffron, paper, musk, perfumes, rose-water, vinegars, elegant shawls, glass bowls and other fine products of Kashmir industry.¹¹

By the seventeenth century, paper was being produced in paper factories spread from Kashmir and Punjab in the north to Bihar and Bengal in the east and Gujarat and Daulatabad in the south.¹²

A miniature of c. 1540 attributed to the famous Persian painter of the Tabriz school, Mir Sayyid 'Alī, depicts a number of processes involved in the production of paper. The scene depicts a *madrasa* in which a variety of activities are shown as taking place. Within an arched building or pavilion, a prince is shown reciting from the Quran, while a teacher is guiding his pupil in the art of wrestling. A *muezzin* calls people for prayers from the roof, and a number of pupils are shown with their books and writing boxes. Amongst all these activities, paper makers and paper dyers (all of whom appear to be the students of the *madrasa*) are shown busy in their work. Outside the building, in the open, a simmering cauldron is shown, while a man with wide-mouthed vessels around him spreads on the ground what appears to be a rectangular sheet of paper. At the edge of the platform fronting the building, some people are shown performing ablutions (*wuḏū*). A person, probably another student, is burnishing and polishing a sheet of paper with a stone-burnisher. At the bottom, a number of people are shown putting finished sheets on a cloth-line, while a solution for colour is dripping through a sieve hung from the branch of a tree.¹³

The process of polishing paper to smoothen it with stone-burnishers is a theme also depicted in Mughal paintings.¹⁴

¹¹ Abu'l Qāsim Firishṭa, *Tārīkh-i Firishṭa*, Nawal Kishore Press, Lucknow, vol. II, p. 344.

¹² S.A.K. Ghori and A. Rahman, 'Paper Technology in Medieval India', *Indian Journal of History of Science*, Vol. I(2) (November 1966), pp. 133–49; Sita Ramaseshan, 'The History of Paper in India upto 1948', *Indian Journal of History of Science*, Vol. 24(2) (1989), pp. 103–21; O.P. Jaggi, *Science and Technology in Medieval India*, being vol. VII of *History of Science and Technology in India*, Delhi, 1981, pp. 170–78; and Alexandra Soteriou, *Gift of Conquerors: Hand Papermaking in India*, Middletown, NJ, 1999.

¹³ 'Industrious School Scene', Mir Sayyid 'Alī, c.1540, Cat. No. S86.0221, The Arthur M. Sackler Gallery, Smithsonian Institute, Washington D.C.

¹⁴ See for example *Jahangir's Album*, cat. No. 54.116, The Freer Gallery of Art, Smithsonian Institute, Washington DC; 'Akbar's Atelier', *Akhlāq-i Nāṣirī*, MS. 39, f. 19 (a); Prince Sadruddin Agha Khan Collection, Rietzberg Museum, Zurich, cf. Brand & Lowry, *Akbar's India: Art from the City of Victory*, New York, 1985, pl. 19; and 'Artists at Work', Berlin Album, Staatsbibliothek Preussischer Kulturbesitz, Berlin in Welch, *India: Art and Culture*, pl. 105.

The only detailed account of making paper is given by the anonymous author of *Bayāz-i Khushbū'ī*, a work on general household management compiled sometime during the reign of Shahjahan.¹⁵ The author devotes a full chapter to 'Colouring of paper etc.', where he also discusses the process of making paper. According to this source, the process started with steeping of four *mans* of hemp or pieces of linen cloth with 20 *sers* of *sajjī* (carbonate of soda) in a *hauz* or tank. When the soaked stuff turned to pulp after being repeatedly pounded over a few days by a wooden *dhelki* (pounder), probably operated manually, it was taken out and rubbed with a mixture of salt and rice. The mixture was again soaked in water till it turned soft and could be easily mashed manually. After the required softness had been reached, the mixture was taken out of the vat, and after mixing it with clean water, it was transferred into a utensil and put to boil. While boiling, it was continuously stirred until it thickened. Then it was allowed to cool and then spread on wooden blocks to form sheets. After the mixture had been poured on the rectangular wooden blocks, it was covered with hemp grass (*kirpās*) and another wooden block was pressed on it with heavy stones, and then left to dry in the sun. The sheets thus formed were further brayed with a muller.¹⁶

In 1675, Fryer described the process of papermaking at Kalyan (Maharashtra), where he saw a mullah 'making such paper as they use', by the side of a 'deep tank' adjacent to a mosque:

After he had steeped cotton rags in water, he by beating brought it into the form of paper; and was pasting them up on the stone sides of the mosque, next the sun to dry; after which they are polished and glazed and so made fit for their use.¹⁷

The process of making sheets in the open could naturally affect the quality of the paper. Thus, while mentioning the fine quality of white paper prepared at Ahmadabad, 'Alī Muḥammad Khān, the author of *Mir'āt-i Aḥmadī* remarks:

As this city is situated in the desert, particles of dust are unavoidably mixed with the pulp. They come out of the paper sheets when they are dried and polished leaving behind imperceptible perforations. This is a defect.¹⁸

We also have a detailed account, written in 1774, which tells us how Indian paper was then prepared. The only major difference in this account and that given in *Bayāz-i Khushbū'ī* appears to be the mention and use of a 'stamping lever', which appears to have replaced the hand-operated pounder (*dhelki*). This probably was a water-powered wooden stamper fitted with a trip hammer.

¹⁵ *Bayāz-i Khushbū'ī*, Ms. India Office Library, Ethel 2784 (rotograph in the Research Library, CAS in History, AMU, Aligarh).

¹⁶ *Ibid.*, ff. 111a–126b.

¹⁷ John Fryer, *A New Account of East India and Persia being Nine Years' Travel*, ed. W. Crooke, I, London, 1909, pp. 351–52.

¹⁸ 'Alī Muḥammad Khān, *Mir'āt-i Aḥmadī*, Baroda, 1928, ed. Nawab Ali, Vol. I, p. 18.

Further, the rice paste mentioned by the author of the *Bayāz* was now applied only when the sheets were ready and about to be put out to dry. The way in which the mould-frame was used to shape the sheets is also explained in some detail.¹⁹

The use of a water-powered wooden stamper fitted with a trip hammer appears in a manuscript from Kashmir of mid-nineteenth century in which a miniature depicts such a hydraulic contraption pounding the hemp mixture to pulp inside a vat.²⁰ Outside two men are shown standing with a sheet of cloth tied to their waists, filtering excess water from the hemp and pulp mixture. The lower half of the miniature depicts the sheets of paper on the drying line, a circular vessel with pulp besides a papermaker who squats besides a pit with a grass-mould frame in hand, and picking the pulp to form sheets. Shown beyond are placed fresh sheets of paper stacked with rock weights. Also depicted is a well to draw water from, burnishing and polishing tools and brushes. Vigne in 1841 actually observed rags being ‘smashed in [water-] mills near Shalimar’ in Srinagar, Kashmir.²¹

A number of paper making pits and vats survive in Kalpi (Uttar Pradesh), Sanganer (near Jaipur), Zafarabad (distt. Jaunpur), Kaghaziwara (near Daulatabad) and Erandol near Mumbai.²² Almost all of them are constructed with rubble-stone or bricks bound with lime mortar. In almost all cases, the fermenting pits are circular, while the pits which contained the pulp to be shaped into sheets are generally rectangular. A detailed exploration of the physical remains of these paper-making factories may throw further light on the traditions of paper manufacture.

Some effort was made in Mughal times to produce ornamented or refined paper, but it is now difficult to follow what the terms employed really mean. Thus, we are told that ‘Abdu’r Raḥīm Khānkhānān, the famous noble under Akbar and Jahāngīr, ‘was greatly attracted by *kāghaz-i ‘aks* (lit. reflecting paper)’, meaning, perhaps, a kind of tracing paper, and that he had invented such paper bearing seven colours. He was also held to be the inventor of *kāghaz-i ābrau*, i.e., perhaps, white or shining paper.²³ How these effects were obtained is not explained.

¹⁹ Lt. Col. Ironside, ‘Uses of the *Son* and Manufacture of the Hindustani Paper’, *Science and Technology in the Eighteenth Century*, ed. Dharmpal, Delhi, 1971.

²⁰ Page from a Kashmiri Manuscript, MS. Or. 1699, India Office Library (British Library), London.

²¹ G.T. Vigne, *Travels in Kashmir, Ladak, Iskardu, & c.*, reprint, Karachi, 1987, Vol. II, p. 121.

²² A. Soteriou, *Gifts of Conquerors*, op. cit., pp. 37–61. While it is true that proper explorations of such paper-manufacturing sites need to be undertaken, it is also useful to go back to early modern reports about them. See, for example, account of paper being made at Harihal (Mysore/Maharashtra) in 1790–91 by Captain Edward Moor, quoted by P.K. Gode, *Studies in Indian Cultural History*, III, (i), Poona, 1969, pp. 20–21; report on paper-making at Bihar Sharif and Arwal in 1811–12 in Buchanan, *An Account of the Districts of Patna and Bihar in 1811–12*, II, Patna, n.d., pp. 623–25; at Kaghaziwara, near Daulatabad in 1820 in William Erskine, ‘Diaries’, *JBBRAS*, XXV, 1918, p. 383; and at Chandaukah in Sind in 1841 in a report by Lieut. Hugh James in R. Hughes Thomas, ed., *Memoirs on Sind*, reprint, Delhi, n.d., II, p. 740.

²³ ‘Abdul Bāqī Nihāwandī, *Ma ‘āṣir-i Raḥīmī*, ed. M. Hidayat Hosain, Bib. Ind., Calcutta, 1910–31, III, pp. 1678–79.

It may have been noticed that the Indian paper-making process lacked the convenience of the wire mesh, which in Europe made all the difference for obtaining high quality paper out of the pulp. The Gutenberg Bible of the fifteenth century was printed on paper that had 28 wire-lines to the inch.²⁴

The inferior quality of Indian paper was naturally noticed by Europeans. There was no ‘paper fit for your books of account’ to be bought in India, the English factors at Surat reported to the Company in 1630;²⁵ and in 1634 those at Masulipatam asked the Company to supply paper to them from England since otherwise, they had to buy such paper ‘from seamen and others at treble the cost in England’.²⁶ In 1666–77, Chardin regarded Iranian paper, made by methods similar to those in India, as ‘brownish, foul, ragged and over-limber’.²⁷ But it was not only the Europeans who preferred European paper. Jahāngīr also greatly admired it and deemed a volume of blank sheets of it as an article fit for a present.²⁸ The manipulations of wires in the wire mesh created the watermarks found in European paper, which were misinterpreted in India as impressions of images so that the paper was called *kāghaz-i butī*, ‘imaged paper’.²⁹

Despite the appreciation of paper of European manufacture, there was no attempt made by Indians to introduce the European method of forming paper sheets. The first such effort in an Indian principality was made in Mysore, where Tipu Sultan (d. 1799) began making ‘paper formed on wires like the European kind’, along with other European products like broadcloth, watches and cutlery.³⁰ But, then, in many ways Tipu Sultan was unique.

²⁴ John Overton, ‘A Note on Technical Advances in the Manufacture of Paper before the Nineteenth Century’, in *A History of Technology*, eds. C. Singer et al., Oxford, 1954–58, III, p. 413.

²⁵ William Foster, *English Factories in India, 1630–1633*, Oxford, 1910, p. 33.

²⁶ William Foster, *English Factories in India, 1634–1636*, Oxford, 1911, p. 51.

²⁷ *Sir John Chardin's Travels in Persia*, reprint of the 1720 edition, London, 1927, II, p. 275.

²⁸ Muṭribī Samarqandī, *Khāṭirāt-i Muṭribī*, ed. Abdulghani Mirzoyef, Karachi, 1971, pp. 22–23. Muṭribī, visiting Jahāngīr's court in 1626 was himself a recipient of the present.

²⁹ Tek Chand Bahār, *Bahār-i 'Ajam*, AH 1152 / 1739–40, s.v. *kāghaz-i butī*, litho. Nawal Kishor, Lucknow, 1916, II, p. 285.

³⁰ Francis Buchanan, *A Journey from Madras, through the Countries of Mysore, Canara and Malabar*, & c., London, 1807, I, p. 70.